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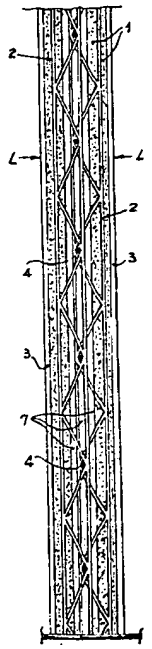
## (54) Reinforced masonry comprising prefabricated slabs.

(57) A reinforced concrete masonry has the two faces formed with a pair of prefabricated reinforced concrete slabs, spaced and mutually connected internally to contain, as an expendable form, a finishing concrete casting.

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# "REINFORCED MASONRY COMPRISING PREFABRICATED SLABS"

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The present invention relates to the construction of masonry in general, as for example retaining walls, foundation walls, load bearing elements, external walls, breastworks and the like, made of reinforced concrete.

More precisely, the present invention provides a reinforced masonry formed with prefabricated reinforced concrete slabs, installed in pairs and spaced to delimit a hollow space containing the finishing concrete casting, characterized in that said slabs are provided with reinforcements partially projecting from a face thereof to be mutually tied by straight steel bars, alternatively inserted into one and into the other reinforcement of said opposed slabs.

Preferably, said reinforcements are flat trellis reinforcements, consisting of two straight longitudinal rods connected to a continuous zigzag rod alternatively welded thereto.

Furthermore, the slabs forming said masonry may be lined on their face opposite to that from which said reinforcements are projecting.

The characteristics of the masonry according to the invention will result more evident to the skilled in the art from the following detailed description of an embodiment thereof, given by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a vertical cross-section view of a pair of prefabricated slabs for forming the reinforced masonry according to the invention, lying opposite and mutually spaced;

Fig. 2 is a view, similar to that of figure 1, but with the two slabs drawn close, in a position for inserting the bars of mutual connection of said slabs; and

Fig. 3 is a view, similar to that of figure 2, but with the slabs mutually connected and with the concrete casting in execution.

With reference to the drawing, the two prefabricated symmetrical

slabs L, for forming the masonry, are made of reinforced concrete 1 with trellis reinforcements 2 inserted by about one half into the concrete, while the other half projects from the inner face of the slab, the outer face of which may be provided with a layer 3 of general coating which, when the masonry is complete, is apt to form its façade. In figure 1, the slabs are placed one in front of the other, in a vertical position, and they are sufficiently spaced to avoid any confusion of superpositions in the drawing. The section reported on the sheet plane is the typical one corresponding to one of the planes on which the reinforcements are arranged, said reinforcements repeating themselves depthwise several times, exactly the same and parallel at an even distance.

The said reinforcements 2 are in the form of a flat trellis, consisting of two straight longitudinal round rods 6, connected to a continuous zigzag constant pitch round rod 5, alternatively welded thereto. The reinforced concrete part 1 of the prefabricated slabs is shown in dashed lines.

To form a masonry, the prefabricated slabs of figure 1 are drawn close, as shown in figure 2, until the portions of their projecting trellis reinforcements arrange themselves the ones on the others in strict adherence. By this arrangement, the zigzag rods 5, through their superposition, are apt to delimit rhomboid-sectioned corridors which are sufficiently wide to house connection bars 4, being thus easily inserted therein depthwise. Figure 2 shows three of these bars 4, consisting of round rods for reinforced concrete and represented by three small circles. The close positioning of the slabs is foreseen by the installation technique in order to be able to easily position in sequence, according to the development of the masonry and operating on the sides of the pairs of slabs, an adequate number of bars for taking the thrust of the concrete casting, proportioning said bars according to the case.

Figure 3 shows the same slabs of figure 2, slightly more spaced

one from the other in order to be able to connect them by means of six bars 4. Figure 3 also shows the concrete filling casting 7 while being executed. Said casting 7, eventually lightened for insulating purposes, is represented by dotted lines, poured from the top to fill the bottom of the hollow space lying between the slabs. These are now spaced as far as required for forming the masonry structure being erected. On the other hand, this positioning forms the limit within which the prefabricated slabs are allowed to move away one from the other under the thrust deriving from the fluid concrete casting 7. The filling of the hollow space, closed on the heads, may thus continue up to reaching the height of the slabs.

Though not illustrated, it is evidently possible to provide for the erection of a higher masonry than that constituted by the slabs L, by superposing - with the technique heretofore specified - a further course of components and connecting its reinforcements to the previous ones, so as to obtain, through a further concrete filling, a monolithic unit.

In the masonry structure of the invention, the prefabricated slabs 1 - acting as expendable forms (in that they remain in the structure as forming part thereof) - constitute the two faces of the structure itself.

Installed opposite, such slabs delimit a specific hollow space apt to house the finishing casting which, as said, is usually formed of concrete at the fluid state.

The considerable thrusts thereby produced, as the casting starts and up to curing thereof, against the inner faces of the slabs 1, are controlled and opposed - with an original technique, characteristic of the present invention - by way of the straight steel bars 4 (usually reinforcement rods for reinforced concrete), which the assembler takes care to insert along the hollow space, into special paths delimited by the rods of said reinforcements, alternating in sequence those of the first slab and those of the other slab, so as

to form ties apt to reciprocally engage the reinforcements of the slabs, preventing at the same time the slabs from being spaced beyond the foreseen extent corresponding to the thickness of the masonry.

The ties start to act when, under the thrust of the casting, the inserted bars take the shearing stresses between the reinforcement rods of both slabs, tending in opposite directions, which rods find themselves adjacent as - during prefabrication - the trellises projecting from the slabs have been appropriately positioned to coincide during assembly.

The masonry with a certain development is erected by placing side by side a sequence of segments formed by pairs of prefabricated slabs.

It is observed that, once the masonry is completed, both the reinforcements arranged during prefabrication of the slabs, and the rods inserted during installation, jointly form an organic design of final reinforcement, which is particularly valid for reinforced concrete masonry and also perfectly apt to withstand seismic shakes.

Also the known techniques provide, in some cases, for the insertion of additional reinforcement rods - during installation - into the reinforcements of prefabricated components, for the erection of reinforced concrete structures. Nevertheless, there is a substantial difference between these techniques and the object of the present invention, in that - up to date - such reinforcements have always been inserted for the mere purpose of taking the stresses proper to the finished structure (after the concrete of the finishing casting has reached the required curing), but never with the object of taking the thrusts produced by concrete at the fluid state onto the inner faces of the prefabricated slabs as expendable forms.

On the other hand, the known techniques are always very burdensome in that they require, as for the common forms, the construction of external supporting structures in order to keep in position the

prefabricated slabs under the thrust of the concrete casting.

In some cases the known techniques, to reduce the burden weighing on said external structures, resort to the use of tie-rods crossing the structure from part to part, in order to tighten the slabs and control the thrust of the casting, with the drawback that said reduced burden is accompanied by the presence of marks caused by the through holes or of residual metal inserts onto the faces of the finished masonry.

On account of all these drawbacks, the use of prefabricated slabs to compose reinforced concrete vertical structures has found, in the building practice, an almost totally inexistent field of application, in spite of the interest for this type of solution.

Whereas, the structure and prefabricated slabs according to the present invention allow to eliminate the aforementioned drawbacks on account of the double function performed by the reinforcements of the prefabricated slabs in conjunction with the connection bars. At first, when the concrete casting is at the fluid state, they have the function of taking the thrust of said casting, without requiring any through tie-rods or external supporting structures for the prefabricated slabs. Later, when the concrete of the casting has stiffened, they also have the function of taking the stresses for which the masonry structure was designed.

Modifications and variants of the heretofore described and illustrated embodiment of the masonry structure according to the invention evidently fall within the scope of the invention itself. For instance, to construct more insulating masonries, ribs can be created in correspondence of the trellis reinforcements 2 while, in correspondence of the surface gaps between said ribs, it is possible to insert hollow clay blocks or to lay down panels of insulating material, as panels of wood and cement mixture or panels of "betongas" and foam cement. Furthermore, the concrete casting 7, apt to fill the hollow space between the slabs 1, can be partly formed - for the

same purpose - of light materials, as vermiculite or pumice or expanded clay.

To obtain the highest degree of insulation, the hollow space between the slabs could even be filled with loose insulating aggregates, possibly taking care to operate, in the accessible spots where the reinforcements are mutually connected, a closer tie with twisted wires and with hydraulic binders.

It should also be noted that, though the accompanying drawing illustrates pairs of prefabricated slabs installed with trellis reinforcements positioned vertically, it is evident that such slabs could equally be installed with trellis reinforcements positioned horizontally, the technique of the present invention remaining unaltered.

It is also understood that the present invention covers masonry formed with pairs of opposed prefabricated reinforced concrete slabs, provided with reinforcements partially projecting from a face thereof, which are tied (instead of simply by a plurality of straight steel bars, alternatively inserted into one and into the other of said interpenetrating reinforcements, as illustrated) by means of a trellis interposed between said projecting reinforcements and two pluralities of bars inserted between said trellis and each of said reinforcements.

## CLAIMS

1) Reinforced masonry formed with prefabricated reinforced concrete slabs, installed in pairs and spaced to delimit a hollow space containing the finishing concrete casting characterized in that said slabs (1) are provided with reinforcements (2) partially projecting from a face thereof to be mutually tied by straight steel bars (4), alternatively inserted into one and into the other reinforcement (2) of said opposed slabs (1).

2) Reinforced masonry as in claim 1), wherein said reinforcements (2) are flat trellis reinforcements, consisting of two straight longitudinal rods (6) connected to a continuous zigzag rod (5) alternatively welded thereto.

3) Reinforced masonry as in claims 1) and 2), wherein the concrete (7) of the finishing casting being poured is partly formed of light aggregates, as vermiculite or pumice or expanded clay.

4) Reinforced masonry as in claims 1) and 2), wherein said slabs (1) comprise panels of insulating material, as panels of wood and cement mixture or panels of "betongas" and foam cement, and/or a plurality of hollow clay blocks into the concrete forming said slabs, in correspondence of the surface gaps between two projecting reinforcements (2).

5) Prefabricated slab of reinforced concrete, to be installed coupled with a mating slab and spaced therefrom to delimit a hollow space to be filled with concrete (7), for the purpose of forming a reinforced concrete masonry, characterized in that it is provided with a reinforcement (2), partially projecting from a face thereof in order to be tied to said opposite mating slab by means of straight steel bars (4) to be inserted into the projecting parts of the reinforcement (2) of said slab and of the mating slab.

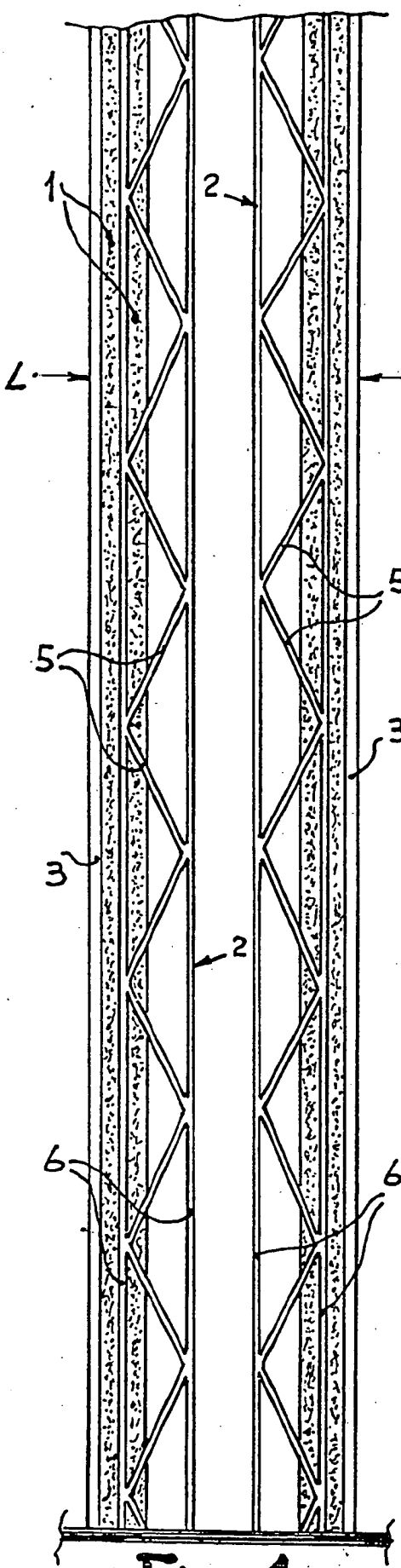


Fig. 1

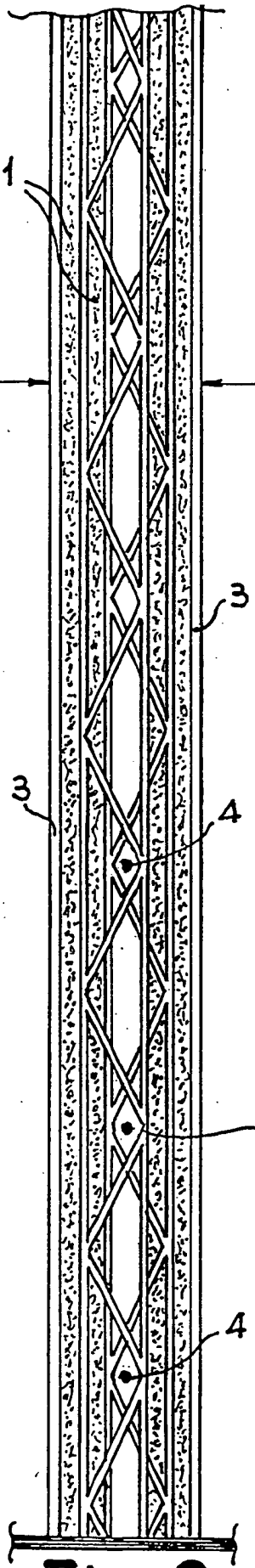


Fig. 2

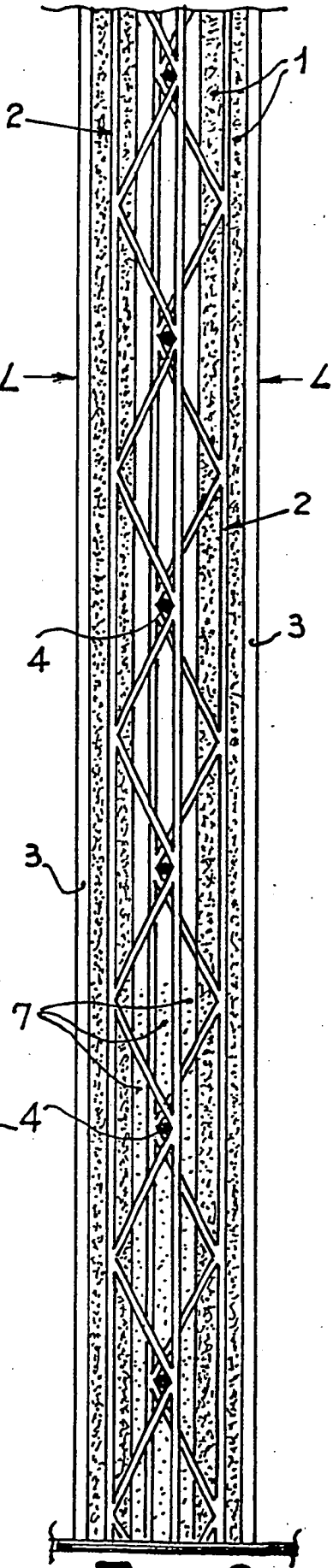


Fig. 3